

REMARKS

This Response is submitted in reply to the non-final office action mailed January 31, 2007. Claims 1-13 are pending in this application. In the Office Action, Claims 1-13 are rejected under 35 U.S.C. §103. No fee is due in connection with this Response. The Director is authorized to charge any fees which may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 112857-442 on the account statement.

In the Office Action, Claims 1-13 are rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Patent No. 6,432,579 to Tsuji et al ("*Tsuji*") in view of Yamamoto et al U.S. 2003/0054249 to Yamamoto et al ("*Yamamoto*"). Also, in the Office Action, Claims 1-13 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Yamamoto* in view of *Tsuji*.

Of the pending claims, Claims 1, 2, 6 and 7 are independent and recite, in relevant part, an anode, comprising an anode collector; first layer including anode active material which is provided on the anode collector, wherein the anode active material includes at least one type of compound of silicon; and a second layer including silicon oxide having a thickness of about 50 nm to about 300 nm wherein the second layer is provided on the first layer. Applicants respectfully submit that the cited references are not combinable and, even if combinable, fail to disclose or suggest every element of the present claims.

Applicants submit that the cited references teach away from each other. For example, *Tsuji* teaches producing a composite powder that combines silicon, which is a metal, and a carbon material. (See, *Tsuji*, column 4, lines 53-56). In *Tsuji*, this composite powder arguably serves as an anode active layer. *Yamamoto*, by contrast, teaches away from silicon-containing anode active material layers of *Tsuji* by stating that elements, such as silicon, in the anode active material inevitably leads to localization of an electric field and corresponding difficulty in maintaining higher levels of cycle properties. (See, *Yamamoto*, page 1, [0013]). Further, *Yamamoto* states that an anode obtains lower operating voltage and capacity when mixing metal (e.g. silicon) with carbon material versus anodes of carbon material lacking silicon. (See, *Yamamoto*, page 1, [0014]). Consequently, all of *Yamamoto*'s embodiments disclose a carbon anode active layer having no silicon, with the carbon anode being made of a carbon material capable of occluding lithium. (See, *Yamamoto*, page 7, [0099]) and Figs. 1, 2, 7, 8, 11, 12, 14,

15, 20 and 21). Accordingly, both references are not combinable because they have opposite teachings with regard to use of silicon in the anode active layer.

Applicants further submit that, even if combinable, the cited references fail to disclose each of the elements of the present claims. For example, the cited references fail to disclose or suggest a first layer including anode active material which is provided on the anode collector, wherein the anode active material includes at least one type of compounds of silicon; and a second layer including silicon oxide having a thickness of about 50 nm to about 300 nm wherein the second layer is provided on the first layer as required, in part, by independent Claims 1, 2, 6 and 7. The Patent Office asserts that *Tsuji* discloses a sintered material that contains silicon as an anode active material and a carbon material; and a base material made of a foil or mesh of conductive metal that serves as an anode or current collector. (See, Office Action, page 3, lines 9-11). Even assuming the Patent Office's assertion is correct, *Tsuji* still fails to disclose, as admitted in the Office Action, a second specific layer including silicon dioxide. (See, Office Action, page 5, lines 8-9).

The Patent Office further asserts that *Yamamoto* remedies this deficiency by disclosing a current collector 1d having an intermediate anode layer 7d consisting of silicon oxide films or a multi-layer film consisting of silicon and its oxide films. (See, Office Action, page 5, lines 11-13). However, the Patent Office neglects to indicate the carbon anode 2d separating the current collector 1d and anode layer 7d. (See, *Yamamoto*, [0125-0126], [0130] and Figs. 14-15). As stated previously, *Yamamoto* teaches that the carbon anode 2d does not have any silicon and even recites the disadvantages of having its carbon anode active layer include silicon. Therefore, despite the Patent Office's assertions, the combination of cited references still fails to disclose or suggest a first layer including anode active material that includes at least one type of compounds of silicon; and a second layer including silicon oxide that is provided on the first layer as required, in part, by independent Claims 1, 2, 6 and 7.

The Patent Office, by combining the references as stated above, has applied improper hindsight reasoning to arrive at the present claims. Even assuming that *Yamamoto* discloses a three-layer anode having an anode collector, anode active material and silicon oxide layer, *Yamamoto* also clearly teaches away from the active material having at least one type of compounds of silicon as required by the present claims. If one skilled in the art were to combine

Yamamoto's teachings with *Tsuji's* arguable disclosure of an anode collector and a silicon-containing active material layer, the combination would clearly change the principal of operation of the inventions disclosed in the cited art. (See, MPEP, §2143.01). For example, if *Tsuji's* silicon active layer replaced the carbon layer in *Yamamoto*, the disadvantages cited above by *Yamamoto* would occur in its own invention. (See, *Yamamoto*, [0013-0014]).

Moreover, the silicon active layer in *Tsuji* serves essentially the same purpose as the silicon oxide layer in *Yamamoto*. *Yamamoto* even discloses that the silicon oxide layer 7d performs the same function as the carbon anode 2d, except more efficiently. (See, *Yamamoto* [0022]). Consequently, at best, both references disclose two different types of active layers, *Tsuji's* arguably being just the silicon layer and *Yamamoto's* being a bi-layer structure of a carbon and silicon oxide layer. Further, neither reference teaches Applicants' advantage of having a silicon-oxide second layer formed on a first silicon layer. Specifically, the silicon oxide layer is intended to inhibit reaction between the anode active material layer (silicon layer) and an electrolyte solution at high temperatures, and to prevent the rise of internal resistance and lowering of capacity of the battery. (See, specification, page 7, lines 5-8).

Finally, the Patent Office asserts that *Yamamoto* readily envisions an anode collector comprising a plurality of layers (at least two layers). Applicants respectfully submit that this has no impact on the present rejection. As stated above, the combination of a carbon layer and silicon oxide layer, at best, serves the single function of being an anode active layer. Moreover, *Yamamoto's* disclose of a "multi-layer structure" in [0130] refers only to multiple bi-layer structures. This is clear even in the passage cited by the Patent Office, where the carbon layer and silicon-oxide layer were formed on the anode multiple times. (See, *Yamamoto*, [0127], [0130] and Fig. 15). In fact, each embodiment in *Yamamoto* contemplates both a single bi-layer structure and a multiple bi-layer structure. (See, *Yamamoto*, Figs. 2, 8, 12, 15 and 21).

For at least the reasons discussed above, the cited art fails to render obvious the claimed subject matter. Accordingly, Applicants respectfully request that the obviousness rejections with respect to Claims 1-13 be reconsidered and the rejections be withdrawn.

For the foregoing reasons, Applicants respectfully request reconsideration of the above-identified patent application and earnestly solicit an early allowance of same.

Applicants also note that the Office Action was first received from the Patent Office on July 3, 2007, over two months after the three month due date of April, 31, 2007. Therefore, Applicants respectfully submit that no extension fee should be assessed in responding to this action and that any extension fee assessed should be refunded. In lieu of a refund, Applicants submit an extension fee for this matter and request that the Patent Office appropriately credits Deposit Account No. 02-1818.

Respectfully submitted,

BELL, BOYD & LLOYD LLP

BY 

Thomas C. Basso
Reg. No. 46,541
Customer No. 29175

Dated: July 23, 2007